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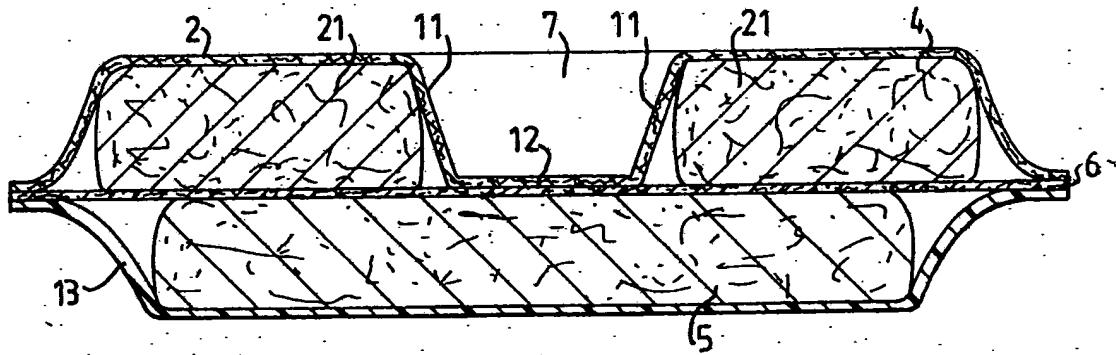
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(54) Title: ABSORBENT ARTICLES INTENDED FOR ONE-TIME USE ONLY



(57) Abstract

The present invention relates to an absorbent article (1, 1') intended for one-time use only, such as a disposable diaper, incontinence guard or the like, comprising an absorbent pad (3) which is composed of at least two separate absorbent layers (4, 5) and a reinforcing layer (6) located between at least two of the absorbent layers, a liquid-permeable outer layer (2) placed on the side of the absorbent body which faces the wearer in use, and a liquid-impermeable outer layer (13) placed on the opposite side of the absorbent body, and which article has a front part (9) and a rear part (10), and an intermediate crotch part (8), and in which the two outer layers (2, 13) and the reinforcing layer (6) extend slightly beyond the absorbent layers (4, 5), at least in the lateral direction of the article, and are mutually joined together. According to the invention, at least one absorbent layer (4) embraced by flexible layers (2, 6, 13) includes in the crotch part (8) at least one elongated, through-passing hole (7), and in that the flexible layers (2, 6, 13) embracing the absorbent layer (4) are joined together through each hole (7).

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Absorbent Articles Intended for One-Time Use Only

The present invention relates to absorbent articles intended for one-time use only, such as a disposable diaper, incontinence guard or the like, comprising an absorbent pad constructed of at least two absorbent layers and having at least one flexible reinforcing layer located between two adjoining absorbent layers, a flexible liquid-impermeable outer layer placed on that side of the absorbent pad which faces towards the wearer in use, and a flexible liquid-impermeable outer layer which is placed on the opposite side of said pad, and which article has a front part and a rear part and an intermediate crotch part, and in which the two outer layers and each reinforcing layer extend beyond the absorbent layers in at least the lateral extension of the article, and are there joined together.

The absorbent material used in the manufacture of disposable absorbent products is chiefly a fibrous material. Normally, cellulose fibres in the form of so-called fluff are used. In recent times, other materials, such as so-called superabsorbents, have been used and then often in combination with fluff. Superabsorbents are materials which can absorb many times their own weight of liquid.

The overall performance of an absorbent article, for instance a diaper with respect to the amount of liquid it can absorb and retain, is highly dependent on the configuration and strength of the absorbent pad present in the article. The absorbent pad shall be capable of absorbing all liquid introduced thereto and of retaining the absorbed liquid without liquid leaking from the pad.

5 In recent manufacture, the configuration of an absorbent pad has progressively been adapted to the shape of the body of the wearer, with the intention of avoiding leakage caused by the unsuitability of rectangular pad shapes.

10 For instance, in order to achieve conformity with the human body, leg recesses are cut in the long sides of the absorbent pad, so as to produce a narrower crotch part which is intended to fit the relatively confined space between the wearer's thighs, and the absorbent pad has also been provided with various sophisticated folds also with the intention of providing a narrower crotch part. In order to provide a sufficiently high absorption capacity, i.e. sufficient absorbent material in the crotch part of the diaper, the width of the absorbent pad is often wider than the space between the wearer's thighs.

15 20 Consequently, a significant part of the absorbent material located between the wearer's thighs is subjected to deformation and strain when the wearer moves, therewith increasing the risk of the absorbent material lumping together or breaking apart and enabling liquid to run past the edges of the absorbent pad without being absorbed thereby.

25 30 In addition to adapting the shape of the absorbent pad to the shape of the user's body, serious efforts have also been made to enhance the mechanical strength of the pad, i.e. to ensure that the pad will hold together and not break apart when subjected to stress, for instance to shear forces resulting from movement of the wearer. For instance, it has been proposed to apply a

reinforcing layer to the absorbent pad by gluing or by binding it to the pad in some other way. Thermofibres have also been admixed with the absorbent fibres in the pad with the intention of binding the fibres together and therewith provide a stronger composite. The admixture of such hydrophobic fibres in the absorbent pad, however, results in certain drawbacks, such as impaired absorption, for instance. The provision of a reinforcing layer on the absorbent pad does not produce satisfactory results, since developments in the endeavour to improve the absorption properties of the absorbent pad have resulted in multilayer absorbent pads which therewith further increase the demand for high mechanical strength in the individual layers of the pad. The presence of a plurality of mutually superposed absorbent layers namely results in greater stresses, in that the layers can move relative to one another and consequently the pad is able to crack apart over smaller or larger parts thereof, resulting in greatly impaired liquid dispersion properties within the layers and also resulting in leakage. The stretchability of an absorbent pad comprised of cellulose fluff, with or without superabsorbents, thermofibres or some other material, is very poor and the risk of the formation of cracks in the crotch part as the wearer moves is relatively high. The forces to which the absorbent pad is subjected may, for instance, be gravitational forces, frictional forces and shear forces. Particularly when the absorbent pad is comprised of several mutually superposed absorbent layers, each of said layers is subjected to shear forces when they are able to move freely against one another along their mutual contact surfaces. Gravitational forces play a significant part in the formation of cracks when the absorbent pad is saturated with absorbed liquid.

- The prime purpose of the present invention is to reduce the risk of such crack formation, by providing an absorbent article which is well adapted to the shape of the wearer's body and which has an absorbent body which exhibits good mechanical strength properties, controlled deformation in the crotch region of the article and good liquid absorption properties.
- This object is achieved in accordance with the invention with an absorbent article of the kind defined in the introduction which is characterized in that at least one absorbent layer surrounded by flexible layers and located in the crotch part of the article includes at least one longitudinally extending, through-passing hole; and in that the flexible layers surrounding said absorbent layer are joined together through each hole in said absorbent layer.
- In the case of an article thus configured, the largest part of the deformation forces generated by movement of the wearer are taken up by the outer layers or the reinforcing layers which surround the absorbent layers. These outer layers or reinforcing layers may consist of non-woven, liquid-permeable surface material, for instance polyethylene or polypropylene, or may also consist of liquid impervious plastic material consisting, for instance, of polyethylene or polypropylene. These material layers thus exhibit the stretchability required to take-up those forces to which the layers are subjected when the wearer moves. Thus, in the case of the inventive article, the stresses are transferred to the reinforcing layers and outer layer in the crotch region where the stresses are greatest, due to the fact that the absorbent pad has been divided in this region

thereof into smaller parts having one or more reinforcing binding regions which relieve the absorbent pad of external forces.

5       The provision of one or more elongated and relatively wide hollow cavities in the crotch part of the absorbent pad provides increased flexibility while, at the same time, imparting to the remainder of the absorbent material more bending room without the material collapsing in an otherwise uncontrolled manner. Bonding of 10      the liquid-permeable outer layer to the reinforcing layer will result in a reinforced join.

15      A further advantage afforded with the provision of cavity spaces is that these spaces can function to take-up liquid.

20      The present invention will now be described in more detail with reference to exemplifying embodiments of an inventive absorbent article illustrated in the accompanying drawings.

Figure 1 is a top view of an inventive diaper with the side of the diaper intended to face towards the user facing towards the viewer and with the inner casing layer partly removed.

Figure 2 is a longitudinal section taken on the line II-II in Figure 1.

30      Figure 3 is a top view of a second embodiment of an inventive diaper with the inner casing layer partly removed.

Figure 4 is a sectional view taken on the line IV-IV in Figure 3.

The diaper 1 illustrated in Figures 1-2 comprises a liquid-permeable layer 2 which lies nearest the body of the wearer in use. This layer preferably consists of non-woven material. In the Figure 1, half 5 of the liquid-permeable layer 2 has been omitted in order to enable those parts of the diaper located beneath said layer to be seen. An absorbent pad 3 is placed beneath the liquid-permeable layer 2 and is divided into an upper absorbent layer 4, which is located immediately beneath the liquid-permeable layer 2, and a bottom absorbent layer 5 which is separated 10 from the top absorbent layer by a liquid-permeable reinforcing intermediate layer 6, which preferably consists of a non-woven material, for instance print bond or spun bond material. It is also conceivable to produce the reinforcing intermediate layer from a layer 15 of perforated plastic. The top absorbent layer 4 is T-shaped, whereas the bottom layer 5 is rectangular. Naturally, other layer configurations are conceivable, for instance hourglass configurations. The bottom 20 absorbent layer is slightly shorter than the top layer, although it may, of course, be equally as long or even shorter than that shown in Figure 1. The thickness, weight per surface area and density of the absorbent 25 layers merely constitute variations apparent to those skilled in this art and are therewith not contingent on the invention.

The absorbent layers 4, 5 are preferably formed from fluff material, although they may also be formed from other absorbent materials or from fibre material admixed with superabsorbents in a manner well known to 30

the person skilled in this art. It is also conceivable to use material of a non-absorbing nature, for instance melt fibres admixed in the layers, therewith to improve the mechanical strength of the layers.

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The top absorbent layer 4 has provided therein a material-free region 7 in the form of an elongated, tapering hole or cavity. The hole 7 is arranged centrally of the diaper and extends in the longitudinal direction thereof and is located in the crotch region 8 of the diaper, said crotch region being situated between the front and the rear parts 9, 10 of the diaper. By "material-free region" is meant all forms of holes, recesses or cavities which can be consciously provided in an absorbent layer in a manner such that the hole is through-passing in the vertical extension of the layer and such that the length and breadth dimensions of the layer are completely surrounded by material-filled regions 21 in said absorbent layer.

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15 Although the hole will preferably have an elongated form, the hole may be circular, oval, rectangular, T-shaped or hourglass shaped, as alternatives to the substantially triangular shape illustrated in Figures 1-2. The form of the vertical edge part 11 of the

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25 hole or hollow is also optional, and may be either oriented obliquely in relation to the surface of the layer or perpendicular thereto. The narrower end of the essentially triangular hole is directed towards the rear part 10 of the diaper, although it may optionally be directed in the opposite direction. Similarly, the hole may alternatively extend from the crotch part 8 and into the rear part 10, when a longer material-free region is desired. However, the hole 7 should not be located in the front part 9 of the diaper, i.e. that 30 part of the diaper formed by the cross-member of the T,

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since this would result in the risk of the hole forming folds in the absorbent pad, these folds functioning to conduct liquid from the pad and therewith cause leakage at the front edge of the diaper.

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The width of the hole, at least over a part of the crotch region, should exceed the thickness of the absorbent pad, i.e. should be at least 10 mm wide at this region, in order to enable those parts of the absorbent layer located on both sides of the hole to be folded-in without said parts contacting one another. In accordance with the purpose of the invention, highly satisfactory results have been achieved with holes which taper and which have a width of 40 mm at their widest part, a width of 20 mm at their narrowest part and a length of 175 mm.

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The liquid-permeable layer 2 is joined to the reinforcing intermediate layer 6 within the material-free region formed by the hole or cavity. The layers 2 and 6 are preferably joined by means of an adhesive, for instance glue or melt glue or in some other way, for instance by ultrasonic welding. The layers may be joined within the whole of said hole or within parts thereof. In the Figure 2 illustration, the bond does not include the whole of the bottom surface 12 of the hole and the liquid-permeable layer 2 which forms part of the vertical edge part 11 of the hole assumes a non-perpendicular angle to the reinforcing intermediate layer 6. This angle may alternatively be a right angle, if so desired.

A liquid-impermeable layer 13 is placed beneath the bottom absorbent layer 5. This layer 13 may consist of polyethylene plastic for instance, or some other liquid

impervious material. The layer 13 is folded over the front and rear edges 14, 15 of the absorbent pad and extends slightly inwardly over said edges towards the side surface facing towards the wearer and in beneath the liquid-permeable layer 2, so as to form two liquid-barrier regions 16, 17 in the respective front and rear parts of the diaper.

The diaper illustrated in Figure 1 also includes fastener devices 18, which may comprise adhesive tabs attached to the liquid-impermeable layer 13 at the short end of the rear part 10 of the diaper. The fastener tabs are then fastened to the front part 9 when the diaper is used. The fastener devices are preferably refastenable in a known manner, although this is not shown in the Figure.

Figures 3-4 illustrate a diaper 1' constructed in accordance with a second embodiment of the invention. The diaper 1' is constructed in substantially the same manner as the diaper 1 shown in Figures 1-2 and the structural elements common to both embodiments have been identified with mutually the same reference signs.

The crotch part 19 of the top absorbent layer 4 has formed therein three elongated, narrowing material-free regions 7 in the form of holes or hollows, while two such holes are formed in the crotch part 20 of the bottom absorbent layer 5. The narrower ends of respective holes 7 in the bottom layer 5 are directed towards the front part 9 of the diaper, whereas the narrower ends of the holes 7 in the top layer 4 are directed towards the rear part 10 of said diaper. These directions may alternatively be reversed. Similarly, the holes 7 may have any other appropriate configuration,

similar to the hole described with reference to Figure 1.

Figure 4 illustrates bonding of the liquid-permeable layer 2 to the reinforcing intermediate layer 6 within the material-free regions 7 in the top layer 4, and also illustrates similar bonding of the liquid-impermeable layer 13 to the reinforcing intermediate layer of material within the material-free regions 7 in the bottom layer 5. The vertical edge parts 11 defining the holes 7 assume a non-perpendicular angle to the reinforcing intermediate layer 6, although this angle may alternatively be a right angle.

The holes 7 may also, in this case, extend rearwardly into the rear part 10 if it is desired that these holes shall form a longer liquid-absorbing region. Furthermore, the various holes 7 may exhibit individual variations with respect to shape and length. The holes of the embodiment illustrated in Figures 3-4 are disposed so as not to overlap one another, which is important because there is constantly found a suction absorbent layer in bordering relationship with the bottom surfaces 12 of respective material-free regions.

The invention is only restricted to the scope of the following Claims and the illustrated embodiments can be modified within the scope of said Claims.

For instance, a diaper or an incontinence guard may comprise more absorbent layers than two with reinforcing layers of material placed therebetween. Not all of these absorbent layers need present holes or hollows, and, in principle, an inventive article may comprise an optional number of absorbent layers.

It is also conceivable to use holes which are not elongated but instead, for instance, circular and arranged sequentially in the longitudinal direction of the diaper or in some other suitable pattern, so as to mutually coact in the formation of elongated fold indications. In this context, an advantage is also afforded with regard to mechanical strength by including a large number of holes, since this will provide a large number of bonding regions while obtaining, at the same time, a larger liquid-receiving area through the presence of many holes than would otherwise be the case with only a few holes or in the total absence of such hollows.

Claims

1. An absorbent article (1, 1') intended for one-time use, such as a diaper, an incontinence guard or the like, comprising an absorbent pad (3) composed of at least two absorbent layers (4, 5) and at least one flexible reinforcing layer (6) located between two adjacent absorbent layers, a flexible liquid-permeable outer layer (2) mounted on the side of the absorbent pad which faces the wearer in use, and a flexible liquid-impermeable outer layer (13) mounted on the opposite side of said pad, and which article has a front part (9) and a rear part (10) and an intermediate crotch part (8), and in which article the two outer layers (2, 13) and each reinforcing layer (6) extends slightly beyond the absorbent layers (4, 5), at least in the lateral direction of the article, and there mutually joined together, characterized in that at least one absorbent layer (4) embraced by flexible layers (2, 6, 13) includes at least one longitudinally extending, through-passing hole (7) which extends at least within the crotch part (8); and in that the flexible layers (2, 6, 13) embracing said absorbent layer (4) are mutually joined in each hole (7) of said absorbent layer.
2. An article according to Claim 1, characterized in that the absorbent layers (4, 5) included in the absorbent body (3) have mutually different extensions in at least their lateral direction; and in that at least the broadest absorbent layer (4) in the crotch part (8) includes at least one through-passing hole (7).
3. An article according to Claim 1 or 2, char -

acterized in that the hole or holes (7) are arranged symmetrically in relation to the longitudinal axis of the article.

5 4. An article according to Claims 1-3, characterized in that each hole (7) that is formed in the absorbent layer (4) which, when the article is worn, lies closest to the wearer's body, has an essentially triangular shape with the apex of the triangle directed towards the rear part (10) of the article.

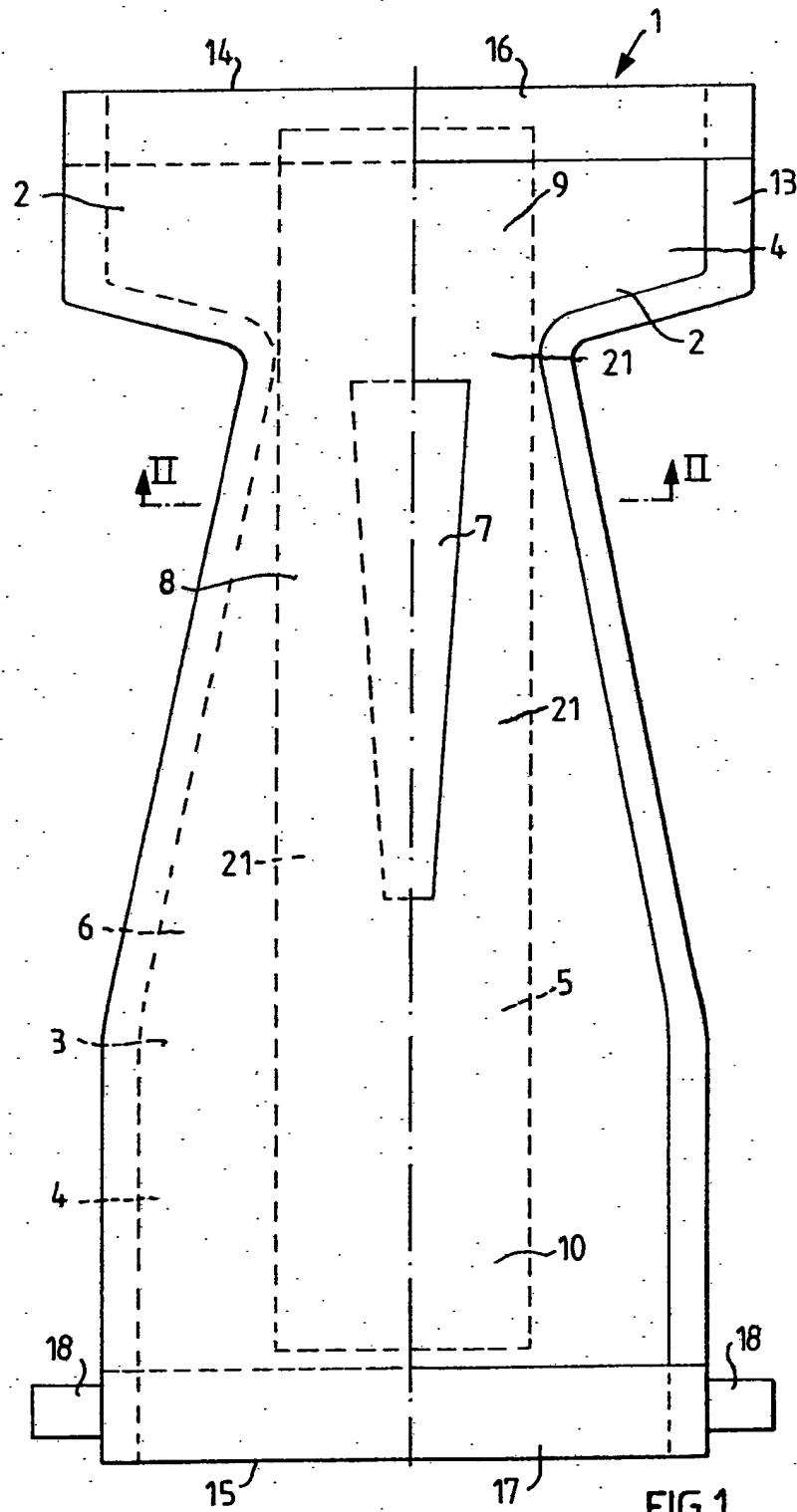
10 5. An article according to Claim 4, characterized in that each hole (7) in the absorbent layers (4, 5) has a triangular shape; and in that the apices of the triangles are directed in mutually opposite directions to the holes of adjacent absorbent layers.

15 6. An article according to Claims 1-5, characterized in that the holes (7) of mutually adjoining absorbent layers (4, 5) do not overlap one another.

20 7. An article according to Claims 1-6, characterized in that an absorbent layer (4, 5) has a pattern of holes (7) formed therein.

25 8. An article according to Claims 1-7, characterized in that the hole (7) formed in the absorbent layer (5) which lies closest to the wearer has a combined width of at least 10 mm over at least a part of the crotch part (8).

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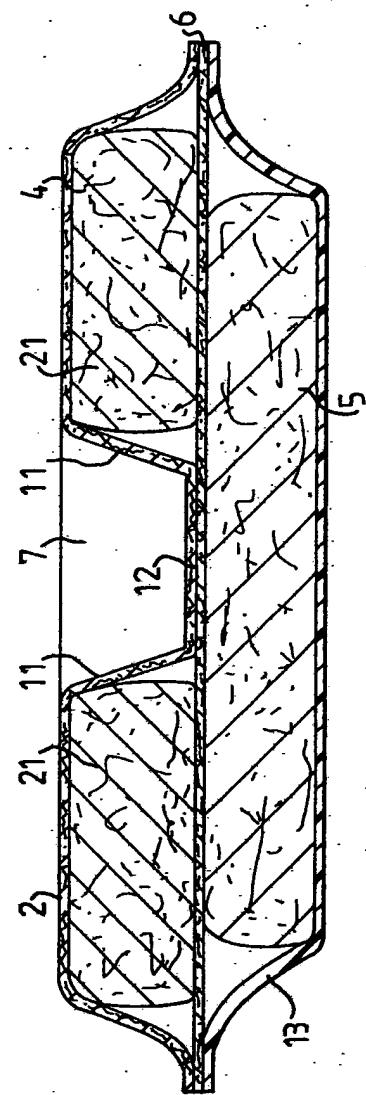
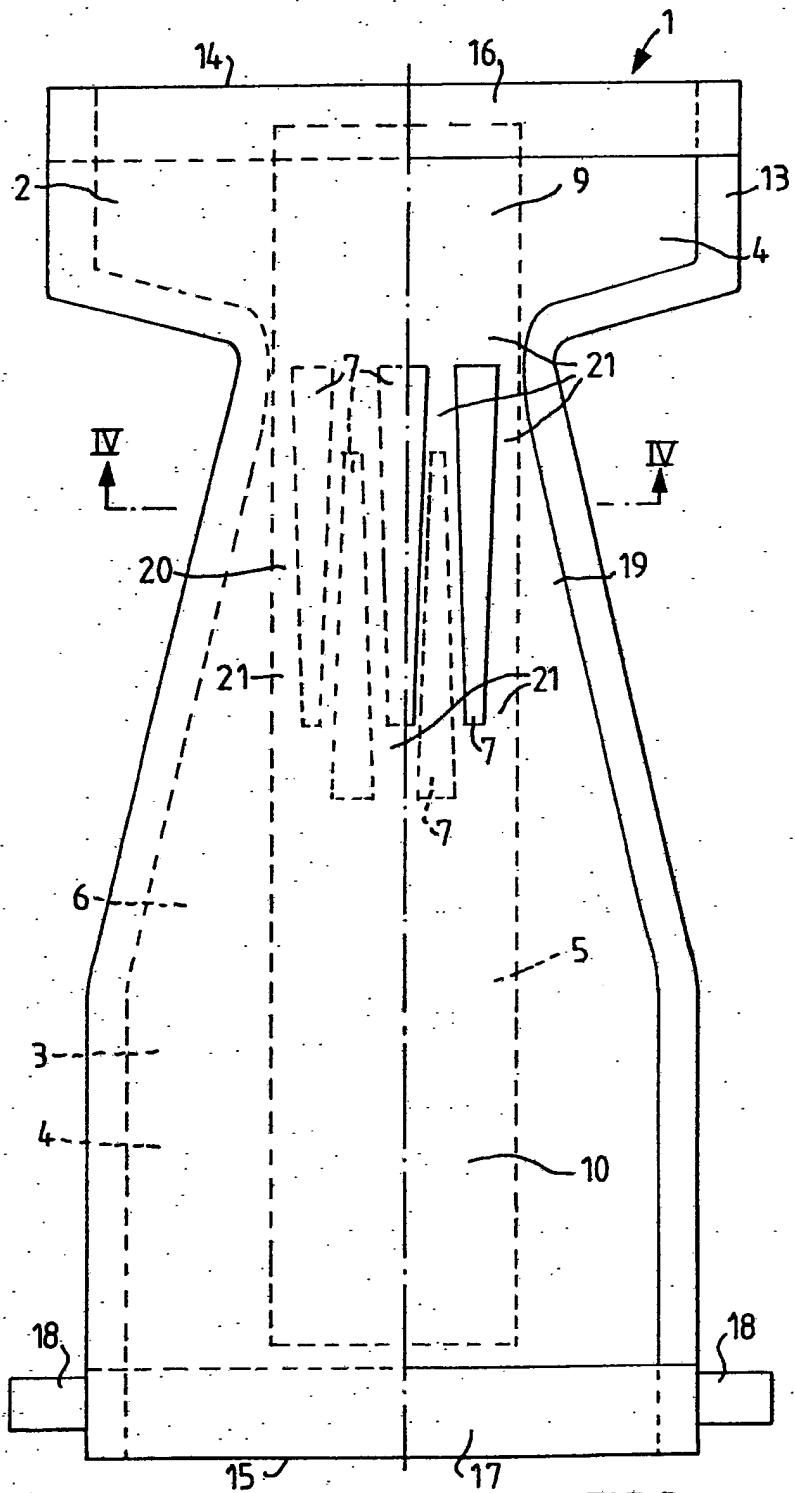


FIG. 2

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**FIG. 3**

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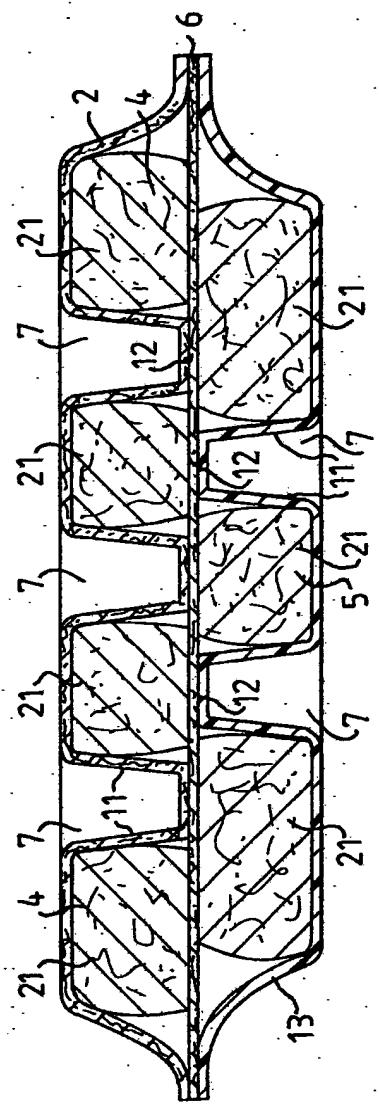


FIG. 4

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# INTERNATIONAL SEARCH REPORT

International Application No PCT/SE 90/00836

## I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all)<sup>6</sup>

According to International Patent Classification (IPC) or to both National Classification and IPC

**IPC5: A 61 F 13/46**

## II. FIELDS SEARCHED

Minimum Documentation Searched<sup>7</sup>

Classification System	Classification Symbols
IPC5	A 61 F

Documentation Searched other than Minimum Documentation  
to the Extent that such Documents are Included in Fields Searched<sup>8</sup>

SE,DK,FI,NO classes as above

## III. DOCUMENTS CONSIDERED TO BE RELEVANT<sup>9</sup>

Category <sup>10</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
X	WO, A1, 8601378 (COLOPLAST A/S) 13 March 1986, see claims, fig 2 ---	1-8
A	FR, A, 2045623 (ETABLISSEMENTS RUBY S.A.) 5 March 1971, see figure 3 ---	1-8
A	EP, A2, 0173068 (PERSONAL PRODUCTS COMPANY) 5 March 1986, see the claims ---	1-8
A	SE, B, 461440 (MÖLNLYCKE AB) 19 February 1990, see claims 1,6 -----	1,2

\* Special categories of cited documents:<sup>10</sup>

- "A" document defining the general state of the art which is not considered to be of particular relevance
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"Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

## IV. CERTIFICATION

Date of the Actual Completion of the International Search

19th March 1991

Date of Mailing of this International Search Report

1991 -03- 20

International Searching Authority

Signature of Authorized Officer

Ingrid Falk

**SWEDISH PATENT OFFICE**

**ANNEX TO THE INTERNATIONAL SEARCH REPORT  
ON INTERNATIONAL PATENT APPLICATION NO.PCT/SE 90/00836**

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.  
The members are as contained in the Swedish Patent Office EDP file on **91-02-28**  
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		AU-D-	4518885	86-01-23
		CA-A-	1252955	89-04-25
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